et No. 2115D-001905



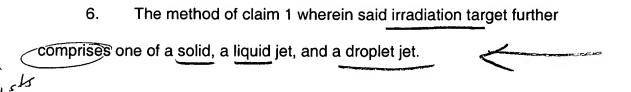
What is claimed is:

A method of generating a collimated beam of high-energy particles comprising:

producing a laser beam having an intensity greater than or equal to about 10<sup>18</sup> W/cm<sup>2</sup> and a pulse duration less than or equal to about 10<sup>-9</sup> seconds; and

irradiating an irradiation target capable of releasing high energy ions with said laser beam.

- 2. The method of claim 1 wherein said irradiation step produces a particle beam with an energy level greater than or equal to about 100keV.
- 3. The method of Claim 1 wherein said irradiation step produces a particle beam directed to within about 40 degrees of normal to said irradiation target.
- 4. The method of claim 1 wherein said pulse duration is less than or equal to about 10<sup>-11</sup> seconds.
- 5. The method of claim 1 wherein said laser beam has a repetition rate greater than or equal to about 10<sup>-3</sup> Hz.



7. The method of claim 1 further comprising:
inducing a nuclear reaction by colliding said particle beam into a secondary target containing a nuclei.

- 8. The method of claim 7 wherein said secondary target is merged with said irradiation target.
- 9. The method of Claim 7 wherein said particle beam includes at least one of protons, deuterons, and tritons.
- 10. The method of claim 7 wherein said secondary target further comprises at least one of boron, carbon, nitrogen, oxygen, and neon.
- 11. The method of claim 7 wherein said particle beam further comprises at least one of boron-11, boron-10, nitrogen-14, oxygen-16, nitrogen-15, and oxygen-18.
- 12. The method of claim 7 wherein said particle beam further comprises deuterons and said secondary target further comprises at least one of boron-10, carbon-12, nitrogen-14, and neon-20.

- 13. The method of claim 7 wherein said laser beam includes a pulse interval shorter than a half-life of isotopes produced by said nuclear reaction.
  - 14. The method of claim 7 wherein said particle beam includes excited atomic nuclei.
  - An apparatus for generating a collimated beam of high-energy particles comprising:
  - a laser adapted to generate a laser beam having an intensity greater than or equal to about 10<sup>18</sup> W/cm<sup>2</sup> and a pulse duration less than or equal to about 10<sup>-9</sup> seconds; and

an irradiation target capable of releasing high energy ions disposed in irradiation receiving relation to said laser beam.

- 16. The apparatus of claim 15 wherein said irradiation target further comprises one of a solid, a liquid jet, and a droplet jet.
  - 17. The apparatus of claim 15 further comprising:

a secondary target containing a nuclei disposed downstream of said irradiation target and receiving a particle beam form said irradiation target to induce a nuclear reaction.

- 18. The apparatus of claim 15 wherein said secondary target is merged with said irradiation target.
- 19. The apparatus of claim 15 wherein said particle beam includes at least one of protons, deuterons, and tritons.
- 20. The apparatus of claim 15 wherein said secondary target further comprises at least one of boron, carbon, nitrogen, oxygen, and neon.